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Standard Guide for Development of Fire Hazard Assessment Standards of Electrotechnical Products[1]

This standard is issued under the fixed designation D5425; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This guide provides guidance on the development of fire hazard assessment standards for electrotechnical products. For the purposes of this guide, products include materials, components, and end-use products.

1.2 This guide is directed toward development of standards that will provide procedures for assessing fire hazards harmful to people, animals, or property.

1.3 *This fire standard cannot be used to provide quantitative measures.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1711 Terminology Relating to Electrical Insulation
E176 Terminology of Fire Standards
E603 Guide for Room Fire Experiments
E1546 Guide for Development of Fire-Hazard-Assessment Standards
E1776 Guide for Development of Fire-Risk-Assessment Standards
E2061 Guide for Fire Hazard Assessment of Rail Transportation Vehicles
E2067 Practice for Full-Scale Oxygen Consumption Calorimetry Fire Tests

2.2 *NFPA Codes and Standards:*[3]

NFPA 555 Guide on Methods for Decreasing the Probability of Flashover (Withdrawn)
NFPA 556 Guide on Methods for Evaluating Fire Hazard to Occupants of Passenger Road Vehicles
NFPA 901 Uniform Coding for Fire Protection

2.3 *International Electrotechnical Commission (IEC) Standards:*[4]

IEC 60695-1-1 Fire Hazard Testing—Part 1-1: Guidance for Assessing the Fire Hazard of Electrotechnical Products—General guidelines (Withdrawn)

2.4 *International Organization for Standardization (ISO) Standards:*[5]

ISO 13943 Fire Safety: Vocabulary

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this guide and associated with electrical and electronic insulating materials, use Terminology D1711.

3.1.2 For definitions of terms used in this guide and associated with fire issues, use Terminology E176, ISO 13943, and IEC 60695-1-1 (see 5.1). Where differences exist in definitions, the definitions contained in Terminology E176 shall prevail.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *electrotechnical product, n*—item that generates or uses electrical power as a source of energy or that is associated with the conduction or transmission of electrical signals or power.

3.2.1.1 *Discussion*—Electrotechnical products include the materials insulating electrical wires and cables and the materials enclosing other products that generate or are fed by electricity, as well as the products themselves and all of their parts.

3.2.2 *fire scenario, n*—a detailed description of conditions, including environmental, of one or more of the stages from before ignition to the completion of combustion in an actual fire at specific location, or in a full-scale simulation.

3.2.3 *products, n*—material, component, or end-use product.

[1] This guide is under the jurisdiction of ASTM Committee D09 on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee D09.21 on Fire Performance Standards.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, http://www.nfpa.org.

[4] Available from International Electrotechnical Commission (IEC), 3 Rue de Varembé, Case postale 131, CH-1211, Geneva 20, Switzerland, http://www.iec.ch.

[5] Available from International Organization for Standardization, P.O. Box 56, CH-1211, Geneva 20, Switzerland or from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

***A Summary of Changes section appears at the end of this standard**

4. Significance and Use

4.1 This guide is intended for use by those undertaking the development of fire hazard assessment standards for electrotechnical products. Such standards are expected to be useful to manufacturers, architects, specification writers, and authorities having jurisdiction.

4.2 As a guide, this document provides information on an approach to the development of a fire hazard assessment standard; fixed procedures are not established. Any limitations in the availability of data, of appropriate test procedures, of adequate fire models, or in the advancement of scientific knowledge will place significant constraints upon the procedure for the assessment of fire hazard.

4.3 The focus of this guide is on fire assessment standards for electrotechnical products. However, insofar as the concepts in this guide are consistent with those of Guide E1546, the general concepts presented also may be applicable to processes, activities, occupancies, and buildings. Guide E2061 contains an example of how to use information on fire-test-response characteristics of electrotechnical products (electric cables) in a fire hazard assessment for a specific occupancy (rail transportation vehicle).

4.4 A standard developed following this guide should not attempt to set a safety threshold or other pass/fail criteria. Such a standard should specify all steps required to determine fire hazard measures for which safety thresholds or pass/fail criteria can be meaningfully set by authorities having jurisdiction.

5. General Concepts

5.1 It is important to understand and maintain the differences between fire hazard and fire risk.

5.1.1 Fire hazard is defined in Terminology E176 as:

5.1.1.1 *fire hazard, n*—the potential for harm associated with fire.

NOTE 1—A fire may pose one or more types of hazard to people, animals, or property. These hazards are associated with the environment and with a number of fire test response characteristics of materials, products, or assemblies including, but not limited to, ease of ignition, flame spread, rate of heat release, smoke generation and obscuration, toxicity of combustion products, and ease of extinguishment.

5.1.2 Fire hazard is defined in ISO 13943 as:

5.1.2.1 *fire hazard, n*—condition with a potential for an undesirable consequence from fire.

5.1.3 Fire risk is defined in Terminology E176 as:

5.1.3.1 *fire risk, n*—an estimation of expected fire loss that combines the potential for harm in various fire scenarios that can occur with the probabilities of occurrence of those scenarios.

NOTE 2—Risk may be defined as the probability of having a certain type of fire, where the type of fire may be defined in whole or in part by the degree of potential harm associated with it or as potential for harm weighted by associated probabilities. However it is defined, no risk scale implies a single value of acceptable risk. Different individuals presented with the same risk situation may have different opinions on its acceptability.

5.1.4 Fire risk is defined in ISO 13943 as:

5.1.4.1 *fire risk, n*—combination of the probability of a fire and a quantified measure of its consequence (scenario fire risk).

5.2 The primary concern in the fire hazard assessment of electrotechnical products is to minimize the fire hazard resulting when such products ignite. Should a fire start, it is then desirable to limit the fire propagation. Give consideration to external events, such as the outbreak of a fire in the environment. In general, however, disregard deliberate misuse of an electrotechnical product, in the fire hazard assessment.

5.3 Give consideration also to heat release (both rate and amount) and opacity, toxicity, and corrosivity of the smoke from a burning product and any necessary ability to function under fire conditions. These hazards are directly related to the ignition and fire propagation. The emission of gases may also, under certain circumstances, lead to the possibility of explosion.

5.4 Certain electrotechnical products such as large enclosures, insulated cables, and conduits, may in fact replace large portions of surfaces and finishing materials of building construction or may penetrate fire-resisting walls. In these circumstances, the requirements for fire performance of the electrotechnical products, when exposed to an external fire, must ensure that they do not contribute to the hazard of fire to a greater degree than is permitted by the building materials or structures that are replaced.

5.5 Following a detailed review of all of the expected hazards as related to a specific fire scenario, the final hazard assessment standards, as drafted, should include a series of tests or a single test, as appropriate, to address the specific hazard(s) defined. Single test standards are acceptable if they address the major hazard(s) defined or are interrelated to the various components involved.

5.6 In order to design electrotechnical products with acceptable characteristics for minimizing fire hazard, pay careful attention to the permissible mechanical, electrical, and thermal stresses. This should minimize the fire hazard under all conditions of use: normal operation, foreseeable deviations from normal use, and faulty operation conditions. The desired level of fire hazard is achievable by the procedures in 5.6.1 – 5.6.3:

5.6.1 The use of parts or circuit design and protection, or both, which, under overload or failure, are not likely to ignite or to cause ignition;

5.6.2 The use of parts, including enclosures, which are sufficiently resistant to probable ignition sources and heat within an electrotechnical product; or,

5.6.3 The use of designs that will adequately resist the propagation of fire spread and surface spread by fire.

6. Types of Fire Tests

6.1 Technical committees engaged in the preparation of requirements and test specifications with regard to fire involving electrotechnical products should recognize the following types of tests:

6.1.1 *Fire Simulation Tests:*

6.1.1.1 These tests examine the reaction to fire of electrotechnical products, in a way as representative as possible of the use of the product in practice.

6.1.1.2 When the actual conditions of use (including foreseeable abnormal use, malfunction, or failure) of a product are simulated as closely as possible, and the design of the test procedure is related to the actual fire hazard, such tests are likely to assess one or more relevant aspects of the fire hazard associated with the use of the product under consideration in a specific scenario. The results of this type of test are thus well suited for use as elements of a fire hazard assessment that takes into account all the factors pertinent to an assessment of the fire hazard of the electrotechnical product in a particular end use.

6.1.1.3 Do not use the results of fire simulation tests for fire hazard assessment when a change of product design is made, or when conditions of use are changed from those simulated in the test.

6.1.1.4 Since such tests are designed specifically for a detailed fire scenario, they often do not become test standards.

6.1.2 *Fire Resistance Tests:*

6.1.2.1 These tests are intended to assess the ability of an electrotechnical product, or one of its parts, to preserve the various properties necessary for its use, under specified conditions of exposure to fire and for a stated period of time. In other words, these tests measure continuity of operation.

6.1.2.2 They are intended to provide data on the electrical behavior and performance of an electrotechnical product, or finished assembly, under a particular condition of exposure to heat or flame.

6.1.2.3 Recent studies show a need for very careful consideration of the test conditions and comparison with the actual fire situation and to the possible effect of any uncontrolled variables, such as the environment in which the product is placed.

6.1.2.4 It is unlikely that the results of fire resistance tests are directly applicable to fire hazard assessment of the corresponding electrotechnical product.

6.1.3 *Combustion Characteristic Tests:*

6.1.3.1 These tests examine the reaction to fire of small standardized specimens under controlled conditions. These tests are used to give data on properties related to the burning behavior of the materials, components, or end-use products tested. They are also useful for comparative evaluations. The fire properties measured include, but are not limited to, flammability, ignitability, flame spread rate, smoke density, fire effluent generation, and heat release rate. Examples of such tests include the application of a number of fire-test-response standards to electrotechnical products.

6.1.3.2 The data provided by such tests are usually not representative of fire performance under conditions other than those to which the specimen is subjected. Combustion characteristic tests are most useful when designed to simulate as closely as possible the situation to which materials, components, or end-use products may be exposed in actual use. They may then lead to the proper selection of materials, components, and end-use products, which will meet the appropriate requirement when testing the complete product.

6.1.3.3 These tests measure responses of electrotechnical materials, components, or end-use products to heat or flame under controlled laboratory conditions. They are a step further away from real fire conditions when compared to fire simulation tests. However, when done appropriately, results from these tests, in combination with those from other tests, may be useful as elements of the fire hazard assessment of an electrotechnical product in a particular end use once all the pertinent factors are taken into account.

6.1.4 *"Basic Property" Tests:*

6.1.4.1 These tests are designed to measure one basic physical or chemical property of a material. They yield information that is, at least to some extent, independent of the testing method. Some examples of such properties are: heat of combustion, heat of vaporization, thermal conductivity, or melting point.

6.1.4.2 In a real fire situation, a number of such properties collectively affect the fire behavior of the electrotechnical product. However, a single basic property measurement will, at most, define only a single aspect of the fire hazard associated with a system. Thus, it is unlikely that the results of these basic property tests are useful elements of a fire hazard assessment.

6.1.4.3 However, eventually, after fire safety engineering develops a firmer technical base, the hope is that the results of combustion characteristic tests may be used to assess a wide range of fire safety situations.

7. Fire Hazard Assessment Standards

7.1 Fire hazard assessment standards are to conform in style and content with *Form and Style for ASTM Standards*.[6]

7.2 Fire hazard assessment standards are to include sections labeled Scope, Terminology, Significance and Use, and Procedure, numbered and arranged in that order.

7.3 *Scope:*

7.3.1 State clearly in the Scope:

7.3.1.1 The product or class of products of interest,

7.3.1.2 The fire scenario(s) included in the standard,

7.3.1.3 The assumptions used in the standard,

7.3.1.4 The structure of the fire hazard assessment procedure, including test methods, models, other calculation procedures, data sources, hazard measures, and evaluation criteria or procedures used,

7.3.1.5 Any limitations on the application of the standard, and

7.3.1.6 Include also, in accordance with *Form and Style for ASTM Standards*, F2.2.2.2, the following caveat: "This standard may be used to predict or provide a quantitative measure of the fire hazard from a specified set of fire conditions involving specific materials, products, or assemblies. This assessment does not necessarily predict the hazard of actual fires which involve conditions other than those assumed in the analysis."

7.4 *Terminology:*

[6] *Form and Style for ASTM Standards*, March 2014, available from ASTM International Headquarters, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959.

7.4.1 Define clearly any terms unique to the fire hazard assessment standard. Use standard terms as defined in Terminology E176 whenever possible.

7.4.2 If appropriate, refer to Terminology D1711 when addressing issues associated with electrical or electronic insulation materials.

7.5 *Significance and Use:*

7.5.1 Describe clearly the major uses and any limitations of the standard fire hazard assessment procedure, and

7.5.2 State clearly the significance of the assessment to users.

7.6 *Detailed Procedure:*

7.6.1 Include in this section detailed descriptions of the fire hazard assessment procedure and its component parts, including test methods, calculation procedures, scenario description, data sources, and evaluation criteria or procedures.

8. Development Process For Developing Fire Hazard Assessment Standards

8.1 *Overview of Elements of Fire Hazard:*

8.1.1 The fire hazard of an electrotechnical product (for example, an electronic component, an enclosure, wire or cable) depends on its properties, on how it is used, and on the environment in which it is used, including the number and type of people and the value and fragility of property possibly exposed to a fire involving it. Therefore, a fire hazard assessment procedure for a particular product must describe the product, how it is used, and its environment.

8.2 *Development of a Fire Hazard Assessment Standard:*

8.2.1 Listed below are the seven basic steps to follow in developing a fire hazard assessment standard:

8.2.1.1 Define the scope (for example, the product range of interest) and context (for example, where and how the products are used),

8.2.1.2 Identify the scenario(s) of concern,

8.2.1.3 Identify the measure of harm to be assessed (for example, deaths, injuries, business loss, property loss),

8.2.1.4 Identify the test methods or calculation procedures needed to produce the measures of fire hazard,

8.2.1.5 Use the scenarios to define key parameters of the test methods or calculation procedures,

8.2.1.6 Identify the types and sources of data required to support the selected test methods and calculation procedures, and

8.2.1.7 Identify the criteria or procedures to evaluate the fire hazard measures.

8.3 *Basic Steps:*

8.3.1 *Defining the Scope and Context:*

8.3.1.1 The first step involves defining the range of products to which the fire hazard assessment standard is to apply (that is, the scope), and examining the points of variability and commonality in the product range and its uses which may be used to define the parameters of the fire hazard assessment procedure. This may be done by answering the following questions:

8.3.1.2 *Products*—What are the range of products to be covered?

8.3.1.3 *Environment*—What is the range of environments in which the product will be used? What does information on the product's environment indicate about the number of persons or quantity and value of property that potentially could be exposed to a fire involving the product, the special capabilities or limitations of the occupants, and the special characteristics or vulnerabilities of the property? What is known about the condition and local environment of the product as it affects the likely conditions of the product's involvement in fire? Is the product always located in an exposed or enclosed space? What types of fire barriers separate the product from other spaces? Is the product used in areas where building systems or other features could contribute to transport of the product's fire effects to remote parts of the property? Is the product typically used as a single unit or as a component of an assembly? Are there other products normally associated with the product in question or installation procedures that may affect the fire hazard development of the product? The classification of property contained in NFPA 901 may be useful for this purpose.

8.3.1.4 *Product Involvement in Fire*—When and how does the product tend to become involved in fire? Is there a particular role in fire that is a primary point of concern for this product range? Based on this information, is it possible to isolate validly a subset of the fire-test-response, and other characteristics listed in (*1*) through (*11*), as the only ones providing significant variation in fire hazard for this product range?

(*1*) Ignitability,

(*2*) Flame spread rate,

(*3*) Heat release—peak rate, rate of rise in rate (fire growth rate), total heat released,

(*4*) Mass loss or smoke generation rate,

(*5*) Opacity of smoke produced,

(*6*) Corrosivity of smoke produced,

(*7*) Profile of toxic (irritant and asphyxiant) species produced—rate, total, toxic potency,

(*8*) Thermal decomposition rates,

(*9*) Endurance under fire conditions—structural integrity, thermal conductivity, mechanical response (for example, melting, collapsing),

(*10*) Ease of extinguishment, and

(*11*) Quantity of product in use relative to size and type of occupancy.

8.3.2 *Identify Scenario(s):*

8.3.2.1 A scenario is a detailed description of the conditions at all of the stages from before ignition to completion of combustion in an actual fire, or in a full scale simulation. Those details are chosen to correspond to a set of real fires whose relative hazards should be reflected by the test method, fire model, or calculation procedure. Because the focus of the assessment is an electrotechnical product, the most important scenario dimensions typically will be those that either define the fire conditions that cause the product to become involved in fire or indicate the point in the fire when the product's contribution will have the greatest consequence for hazard. To determine this, it is necessary to answer questions like the following:

(1) Is the product a likely first item ignited?

(2) Is the product a potential significant fuel source even if not the first item ignited?

(3) Is the product a potential avenue of flame spread?

(4) How close is the exposed population (or the most critical property) to the fire, and what does this imply about the most critical stage of the product's fire involvement?

(5) If one of these situations can be identified as the greatest concern, then that may mean that one product fire performance characteristic is of greatest importance, such as the product's ability to generate a significant hazard quickly, its total hazard capacity (for example, the quantity in use), or the persistence of its hazard during and after suppression operations. Use the determinations to define test methods or calculation procedures that measure the product's contribution to fire hazard at those stages of the fire.

8.3.3 *Identify Measures of Fire Hazard to be Used* —There are several types of measures or criteria useful to assess fire hazard:

8.3.3.1 *Direct Criteria*—Deaths, injuries, or property damage are the measures most directly related to the ultimate concerns of fire impact on people and property.

8.3.3.2 *Fire-Test-Response Characteristics*—Use them individually or as elements in a fire-characteristic profile. These criteria come directly from test methods, which may reduce their uncertainty, and tend to be based on tests involving only the product, which may simplify the process of isolating differences between products. These are advantages of such profiles. However, establish the relative importance, interaction, and even relevance of the fire-test-response characteristics, individually and collectively, to the hazard posed by the product by comparison to more thorough assessments, such as established scientific laws, large-scale tests, and analyses of real fires. The need for such comparisons exists for all fire hazard measures but is greatest for fire characteristic profiles, because they are farthest removed from end-outcome measures; this is a disadvantage of this approach.

8.3.3.3 *Fire-Characteristic Index*—Calculate a fire-characteristic index from component fire-test-response characteristics or intrinsic fire properties, or derive it directly from combinations of fire test responses measured in appropriately designed test methods. Such an index may facilitate the distinguishing of product differences, and because it integrates several fire-test-response characteristics, it may permit identification of simple evaluation criteria. The disadvantages of this approach include the need to demonstrate that the index validly integrates the component characteristics, which is likely to include the need for comparison of the index to results from large-scale tests and analyses of real fires.

8.3.3.4 The intent of this step is to select hazard measures that will provide valid technical information sufficient to estimate and make decisions on the product's contribution to fire hazard. The end outcomes of damage to people and property are always the concern of the fire hazard assessment, but direct measures of those outcomes are unnecessary if it can be shown that simpler procedures and associated measures of hazard will produce the same assessment of products in the product class.

8.3.4 *Identify Test Methods or Calculation Procedures:*

8.3.4.1 It is likely that completing the steps in 8.3.1 – 8.3.3 will lead the developers of a fire hazard assessment standard to identify appropriate test methods and calculation procedures capable of producing the designated hazard measures. At this point, the greatest concerns of a standard developer should be the following:

8.3.4.2 The possibility that the scenario(s) defined in 7.3 will require parameters in combinations that no existing test method or calculation procedure can provide, or

8.3.4.3 The possibility that the tests on and experience with the selected test methods or calculation procedures are not sufficient to establish that they will produce hazard measures properly representative of end-outcome hazards in real fires. Therefore, the developer should carefully review and document the evidentiary base on the selected test methods and calculation procedures. If that evidentiary base is insufficient or indicates important deficiencies in the methods or procedures, then the developer should address them through some combination of further research, redesign of the procedure, or limitation of the scope of the standard.

8.3.5 *Use Scenarios to Define Key Parameters:*

8.3.5.1 A test method or calculation procedure requires a number of specifications or input values. For example, a test for the rate of heat release of a burning product requires specification of the circumstances of ignition (for example, piloted ignition), the level of incident heat flux, and any requirements for control of oxygen or humidity levels in the combustion atmosphere. A calculation procedure for estimating the development of a fire involving a product may require input data on the first item ignited in fire—its mass and burning characteristics—and the distance from the first item to the product.

8.3.5.2 Set each of the specifications and input values required by the test methods or calculation procedure on the basis of inference from the characteristics of the scenario already selected. This is likely to require use of statistics on characteristics of relevant historical fires and some documented judgments by experts. It also may require some iteration, in which the process of defining key parameters identifies ambiguities in the definition of the relevant scenarios, leading to clarification or even redefinition, and finally to completion of the process of defining key parameters. Define the scenarios and the test methods and calculation procedures compatibly, and iterative modification of all three is likely to be required to make them fit.

8.3.6 *Identify Types and Sources of Data:*

8.3.6.1 Data available for use in a fire hazard assessment may be of any of three types: (*1*) test results, based on the use of small-scale test methods or large-scale test protocols of the types described in Section 6, (*2*) measurements of or statistics on characteristics of historical fires, or (*3*) documented judgments by experts. In selecting data, take the following considerations into account.

8.3.6.2 Assess the adequacy of the data and data sources (*1*) relative to basic standards of precision and accuracy, (*2*) relative to the calculation procedure's assumptions as to what the data represent, and (*3*) to show that they are sufficiently representative of the real fire situations to which they are meant to apply.

8.3.6.3 Ensure that fire experience data has sufficient precision and level of detail for the use made of it. Major sources of fire experience data include the U.S. Fire Administration's (USFA) National Fire Incident Reporting System (NFIRS), the National Fire Protection Association's (NFPA) major fire investigation reports, Fire Incident Data Organization (FIDO), the vehicle accident reports of the National Transportation Safety Board (NTSB), and the field-study investigations of the Consumer Product Safety Commission (CPSC).

8.3.6.4 Well-devised, large-scale experiments can provide detailed data on full-scale fires. Some fire phenomena may not manifest themselves in small-scale experiments as they do in large-scale experiments and real fires, and many times these phenomena are not measurable after the fact in real fires. Therefore, check any fire hazard assessment procedure that does not use large-scale experiments as a data source against data from large-scale experiments to establish that relevant phenomena are being properly captured. If room-scale fire tests are used, Guide E603 and Practice E2067 should be used.

8.3.6.5 Small-scale experiments offer the greatest potential for control and therefore may produce very detailed data with greater repeatability than other data sources. Where possible, use standard tests approved by ASTM committees. Where appropriate ASTM standards are not available, use standards developed through a consensus process, preferentially.

8.3.6.6 If data on fire effects on people are used, check the data against fire experience data to establish that the key assumptions of the calculation procedure produce results consistent with relevant fire experience.

8.3.6.7 Fire experience data is based on historical fires and so cannot provide data on new products or new uses of existing products. Therefore, it is unlikely that any fire hazard assessment procedure based solely on fire experience data will have enough scope of application to be sufficient.

8.3.7 *Interpretation of Results:*

8.3.7.1 At this point, the fire hazard assessment procedure will have been designed sufficiently to indicate which hazard measures and calculations are to be used, but the interpretation of the results may still pose additional technical questions.

8.3.7.2 If more than one hazard measure is to be used, specify in the standard the procedure to be used in calculating an overall fire hazard comparison between the product and a baseline or between the product and another product or products. This procedure might be a formula for calculating one overall hazard measure from several, in which case present a validated scientific rationale for the formula. The procedure could be a set of decision rules, such as a rule that suggests that one product may be better than another if, for example, the first product is better on all hazard measures identified to be of concern. In using this rule, it may not be strong enough in a specific case of two products to provide for a definite comparison as to the overall hazard.

8.3.7.3 If more than one scenario was used, the standard should specify the procedure for calculating an overall fire hazard comparison between the product and a baseline or between the product and another product. This procedure might be a formula or a set of rules. If it is possible to assign relative probabilities of occurrence to the scenarios, as in a fire risk assessment, this would provide one formula for calculating a single measure from several scenario measures.

8.3.7.4 If the hazard measures used are not end-outcome measures, such as numbers of deaths, injuries, or monetary loss, then the standard should provide guidance on the implications of particular values or ranges of the fire hazard measures.

8.3.7.5 The standard should not attempt to set a safety threshold or other pass/fail criterion, but should specify all steps required to determine fire hazard measures for which safety thresholds or pass/fail criteria can be meaningfully set by responsible officials using the standard.

9. Keywords

9.1 electrotechnical products; fire; fire hazard; fire risk; fire safety; fire test; flame spread; heat release; ignitability

APPENDIX

(Nonmandatory Information)

X1. COMMENTARY

X1.1 The user of this guide should be aware of other standard guides for fire hazard assessment standards developed or being developed, both nationally and internationally.

X1.2 ASTM Committee D09 (and in particular subcommittee E05.33 on Fire Safety Engineering) is responsible for Guide E1546, which gives general guidance on the development of fire hazard assessment standards. ASTM Committee E05 (and in particular subcommittee E05.17 on Fire Safety in Transportation) is responsible for Guide E2061, which gives specific guidance on the development of fire hazard assessment standards for rail transportation vehicles, and includes information on application of fire test results for electrical wires and cables.

X1.3 The International Electrotechnical Commission (IEC) had a document addressing guidance for assessing fire hazard of electrotechnical products, namely IEC 60695-1-1, but it has now been withdrawn.

X1.4 Similarly, NFPA has also developed a guide for developing methods to decrease fire hazard by decreasing the probability of flashover: NFPA 555. NFPA has also developed a parallel document, NFPA 556, Guide on Methods for Evaluating Fire Hazard to Occupants of Passenger Road Vehicles, to investigate issues associated with fire hazard in passenger road vehicles, which also includes information on electrical wires and cables, especially under the vehicle hood.

X1.5 ASTM Committee D09 (and in particular subcommittee E05.33 on Fire Safety Engineering) is responsible for Guide E1776, which gives general guidance on the development of fire risk assessment standards. See 5.1 for a discussion on the difference between fire hazard and fire risk.

SUMMARY OF CHANGES

Committee D09 has identified the location of selected changes to this standard since the last issue (D5425 – 13) that may impact the use of this standard. (Approved Nov. 1, 2014.)

(1) Revised Section 3.

Committee D09 has identified the location of selected changes to this standard since the last issue (D5425 – 08) that may impact the use of this standard. (Approved Nov. 1, 2013.)

(1) Revised Section 5.
(2) Added Guide E1776 and NFPA 556 to Section 2.
(3) Revised Appendix X1.